AN AFFORDABLE ADVANCED SPACE VLBI MISSION

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We have defined an affordable Advanced Space VLBI mission that would be a successor to the VSOP and Radioastron missions that will take place in the mid-1990s. The major focus of this mission would be to improve the sensitivity over VSOP by a factor of 30 100 at frequencies between 1.6 and 22 GHz, with reasonable performance also available at 43 GHz. Design goals for the 1.6- to 22-GHz range are (1) a 30-111 space antenna with 60% aperture efficiency; (2) a data rate of at least 1 Gbit/s; and (3) a system temperature of 10 1{. The spat.c antenna would be an inflatable surface, perhaps with additional stiffening to provide the desired high-frequency performance. Its design would be strongly influenced by a NASA IN-STEP (In-Space Technology Experiments Program) experiment scheduled for 1995, in which a 14-m-diameter inflatable reflector structure will be deployed, with a goal of achieving an r.m.s. surface precision better than 1 mm. The technology for recording at least 1 Gbit/s already exists and will be built into the M1{ IV recording and correlation system now under development by the 1 laystack Observatory and the European VLBI Network. The low system temperatures desired will require continued development of long-lifetime, S])acc-qualified cooling systems.

Each of the three design goals listed above would provide a factor of 3 5 improvement over the interferometer sensitivity for VSOP. When **they** are combined, the 22-GHz interferometer sensitivity for the advanced mission would be about 60 times better than for VSOP. On a baseline to a VLBA antenna, the sensitivity would be about 10 times better th an for two VLBA antennas recording 128 Mbit/s. The added sensitivity would enable new Space VLBI investigations including (1) high spatial- and time-resolution imaging of weak cores of active galactic nuclei (AGN) such as Seyfert galaxies; (2) much higher dynamic range maps of core-dominated AGN; (3) imaging of radio stars in their quiescent states; and (4) observations of a large enough sample of extragalactic H_2O masers to derive an improved value for Hubble's constant.